

C2 to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter, comprising the steps of:

maintaining at least a portion of the compounds responsible for the ash formation in a gaseous state;

collecting at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

25. (Amended) An emission control system, comprising:

a particle filter, and

C3 an arrangement disposed upstream from the particle filter, the arrangement being configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, and including:

means for collecting at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

means for converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

REMARKS

I. Introduction

Claims 14 to 25 are pending in the present application. In view of the foregoing amendments and the following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

Applicants note with appreciation the acknowledgment that the drawings filed on June 20, 2001 are accepted.

Applicants note with appreciation the acknowledgment of the claim for foreign priority and the indication that all certified copies of the priority documents have been received.

II. Rejection of Claims 14 to 16, 19, 20 and 22 to 25 Under 35 U.S.C. § 102(b)

Claims 14 to 16, 19, 20 and 22 to 25 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,850,735 ("Araki et al."). Applicants respectfully submit that Araki does not anticipate the present claims as amended herein for the following reasons.

Claims 14, 22 and 25 are independent. Claim 14 relates to an emission control system that includes a particle filter and an arrangement disposed upstream from the particle filter and configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state. Claim 14 recites that the arrangement includes a device configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas and a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash. Support for the amendments to claim 14, and claims 22 and 25, may be found, for example, on page 2, line 26 to page 3, line 3 of the Specification.

Claim 22 relates to a method for operating an emission control system, the emission control system including a particle filter and an arrangement disposed upstream from the filter, the arrangement configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter. Claim 22 recites that the method includes the step of maintaining at least a portion of the compounds being responsible for the ash formation in a gaseous state. Claim 22 recites that the method also includes the step of collecting at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas. In addition, claim 22 recites that the method includes the step of converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

Claim 25 relates to an emission control system that includes a particle filter and an arrangement disposed upstream from the particle filter and configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state. Claim 14 recites that the arrangement includes means for collecting at least a portion of the

ash-forming compounds of sulfur contained in the exhaust gas and means for converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

Araki et al. purport to relate to a method for purifying exhaust gas of an internal combustion engine by supplying fuel to an exhaust gas passage upstream of a sulfate absorbent in order to raise the temperature of the exhaust gas flowing into the sulfate absorbent. By raising the exhaust gas temperature above a predetermined peak temperature, the ratio of SO_3 in the SO_x mixture released from the sulfate absorbent is caused to decrease. The temperature is selected in such a manner that, when SO_x is released from the sulfate absorbent, the amount of SO_3 , i.e., the amount of particulate matter, released into the atmosphere is relatively low.

The Office Action states that with respect to claims 14, 15, 22, and 25, "as shown in Figure 9, Araki et al. disclose an emission control system configured for use with an internal combustion engine (1) and a method for operating such system." Office Action at page 2. The Office Action contends that "[t]he system comprises: - a particle filter (93); and - an arrangement disposed upstream from the particle filter and configured to prevent development of ash upstream from the particle filter by one of transformation and maintenance of at least one of the compounds responsible for ash formation in the gaseous state, the arrangement including: - a device (coating layers of alumina on the surface wall of the exhaust gas passages of the filter (93)) configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas (lines 34-59 of column 15 and lines 5-16 of column 7); and - a device (91) configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash (the oxidation catalyst (91) oxidizes the rich components in the exhaust gas so that the oxygen level in the exhaust gas is reduced and the temperature of the exhaust gas is raised to a level sufficiently high to maximize the transformation of the collected sulfur compound into gaseous compounds of sulfur)." Office Action at pages 2 to 3. In addition, the Office Action contends that, with respect to claim 16, "in the emission control system of Araki et al., the arrangement includes a SO_x collector (93)." Office Action at page 3. The Office Action also contends that, with respect to claims 19 and 20, "in the emission control system of Araki et al., the arrangement includes an oxidation catalyst (91)." Office Action at page 3. The Office Action also contends that, with respect to claim 23, "the method of Araki et al.

further comprises the steps of: operating the emission control system in a normal operating phase with a lean exhaust composition to store sulfur contained in the exhaust gas; and - operating the emission control system in a regeneration phase with a rich exhaust composition to release stored sulfur as at least one gaseous compound." Office Action at pages 3 to 4. The Office Action also contends that, with respect to claim 24, "in the method of Araki et al., the step of operating the emission control system in the regeneration phase includes the substep of raising an exhaust temperature to between 550°C and 700°C (lines 9-46 of column 10)." Office Action at page 4.

It is respectfully submitted that Araki et al. do not disclose, or even suggest all of the claim limitations recited in claims 14, 22 and 25. For instance, Araki et al. do not disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claims 14, 22 and 25. Araki et al. describe a method for purifying the exhaust gas of an internal combustion engine. Col. 2, lines 38 to 39. The exhaust gas of an internal combustion engine containing sulfur oxide is contacted with a sulfate absorbent at a temperature lower than a releasing temperature. Col. 2, lines 40 to 43. The temperature of the sulfate absorbent after it has absorbed sulfur oxide is then raised to a predetermined temperature higher than the releasing temperature to cause the sulfate absorbent to release the absorbed sulfur oxide. Col. 2, lines 43 to 47. The sulfate absorbent absorbs sulfur oxide in the exhaust gas when the temperature is lower than the releasing temperature and releases the absorbed sulfur oxide when the temperature becomes higher than the releasing temperature. Col. 2, lines 47 to 51. The predetermined temperature to which the sulfate absorbent is heated is selected in such a manner that the ratio of the sulfur trioxide component in the sulfur oxide mixture released from the sulfate absorbent at this predetermined temperature is lower than the ratio of the sulfur trioxide in the sulfur oxide mixture released from the sulfate absorbent at the releasing temperature. Col. 2, lines 51 to 57. Thus, Araki et al. seek to minimize the amount of SO₃, i.e., particulate matter, released from a sulfate absorbent into the atmosphere, not to reduce clogging of the particle filter. Furthermore, Araki et al. describe that coating layers are applied directly on the

surface wall of the exhaust gas passages of the filter. See, for example, column 6, lines 48 to 57. Thus, these coating layers are part of the filter, and thus are not located upstream of the filter. Still further, Araki et al. describe that the coating layers of alumina on the surface walls of the exhaust gas passages of the filter are configured to collect ash-forming compounds of sulfur contained in the exhaust gas. See, for example, column 7, lines 5 to 15. Since these ash-forming compounds are trapped by the coating layers, they result in increased clogging of the filter, not a reduction in the clogging of the filter. Thus, Araki et al. do not disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claims 14, 22 and 25.

however
this is
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only

To anticipate a claim, each and every element as set forth in the claim must be found in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the . . . claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). That is, the prior art must describe the elements arranged as required by the claims. In re Bond, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). As more fully set forth above, it is respectfully submitted that Araki et al. do not disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claims 14, 22 and 25 as amended herein. It is therefore respectfully submitted that Araki et al. do not anticipate amended claims 14, 22 and 25.

Additionally, to reject a claim under 35 U.S.C. § 102, the Examiner must demonstrate that each and every claim limitation is contained in a single prior art reference. See, Scripps Clinic & Research Foundation v. Genentech, Inc., 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991). Still further, not only must each of the claim limitations be identically disclosed, an anticipatory reference must also enable a person having ordinary skill in the art to practice the claimed invention, namely the

inventions of the rejected claims, as discussed above. See, Akzo, N.V. v. U.S.I.T.C., 1 U.S.P.Q.2d 1241, 1245 (Fed. Cir. 1986). In particular, it is respectfully submitted that, at least for the reasons discussed above, the reference relied upon would not enable a person having ordinary skill in the art to practice the inventions of the rejected claims, as discussed above. Also, to the extent that the Examiner is relying on the doctrine of inherency, the Examiner must provide a "basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics necessarily flows from the teachings of the applied art." See M.P.E.P. § 2112; emphasis in original; and see, Ex parte Levy, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). Thus, the M.P.E.P. and the case law make clear that simply because a certain result or characteristic may occur in the prior art does not establish the inherency of that result or characteristic. Accordingly, the anticipation rejection as to the rejected claims must necessarily fail for the foregoing reasons.

In summary, it is respectfully submitted that Araki et al. do not anticipate claims 14, 22 and 25.

As for claims 15, 16, 19 and 20, which ultimately depend from claim 14 and therefore include all the limitations of claim 14, and claims 23 and 24, which ultimately depend from claim 22 and therefore include all the limitations of claim 22, it is respectfully submitted that Araki et al. do not anticipate these dependent claims for at least the same reasons given above in support of the patentability of claims 14 and 22.

III. Rejection of Claims 17, 18 and 21 Under 35 U.S.C. §103(a)

Claims 17, 18 and 21 were rejected as unpatentable under 35 U.S.C. §103(a) over Araki et al. in view of U.S. Patent No. 6,233,927 ("Hirota et al."). Applicants respectfully submit that the combination of Araki et al. and Hirota et al. does not render obvious the present claims for the following reasons.

Hirota et al. purport to relate to an exhaust gas purification device, including a NO_x absorbent arranged in an exhaust passage of an engine for absorbing NO_x therein when an air-fuel ratio of an exhaust gas flowing into the NO_x absorbent is lean. According to Hirota et al., the NO_x absorbent discharges NO_x absorbed therein when a concentration of the oxygen in the exhaust gas flowing into the NO_x absorbent decreases. Hirota et al. state that a trapping element arranged in

the exhaust passage upstream of the NO_x absorbent for trapping particulates, a processing element for processing the particulates trapped in the trapping element to regenerate the trapping element, and a preventing element for preventing the exhaust gas from flowing into the NO_x absorbent from the trapping element when the trapping element is regenerated.

The Office Action states that, with respect to claims 17 and 18, "the system of Araki et al. discloses the inventions as cited above," Office Action at page 4, but admits that "[Araki et al.] fail [sic] to disclose that the arrangement further includes an NO_x collector." However, the Office Action contends that "[a]s shown in Figure 1, Hirota et al. teach an exhaust gas purification device comprising a particle filter (7) that also absorbs SO_x in the exhaust gas and a NO_x collector (11) to purify harmful NO_x emissions in the exhaust gas." Office Action at page 4. The Office Action asserts that "[i]t would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the NO_x collector taught by Hirota et al. in the system of Araki et al., since the use thereof would have reduced the emission of harmful NO_x gas into the atmosphere." Office Action at pages 4 to 5. The Office Action also contends, with respect to claim 21, that "in the modified emission control system of Araki et al., the arrangement includes an oxidation catalyst (91)." Office Action at page 5.

Claims 17, 18 and 21 depend from claim 14. As more fully described above, Applicants respectfully submit that Araki et al. do not disclose, or even suggest, all of the limitations recited in claim 14. For example, Araki et al. fail to disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claim 14. Furthermore, Hirota et al. do not cure the critical deficiencies of Araki et al. Hirota et al. purport to describe a trapping element arranged in the exhaust passage upstream of the NO_x absorbent for trapping particulates and a processing element for processing the particulates trapped in the trapping element to regenerate the trapping element. According to Hirota et al., the processing element has a heater for heating the trapping element to burn the particulates trapped in the trapping element. Column 2, lines 11 to 13. Hirota et al. state that "[w]hen it is judged that the filter 7 should be regenerated, the changing

valve 15 is controlled to cause the exhaust gas to flow into the bypass passage 13, and the filter 7 is heated by the heater 8." Column 5, lines 29 to 32. Hirota et al. also state that "[d]uring the heating of the filter 7, air is introduced into the filter 7 as required to burn the particulates trapped in the filter 7 [and that, in] the above process, the particulates trapped in the filter 7 are burned, and thus are eliminated from the filter 7." Column 5, lines 32 to 36. Thus, Hirota et al. also fail to disclose, or even suggest, an arrangement disposed upstream from the particle filter and that is configured to at least reduce clogging of the particle filter by prevention of development of ash upstream from the particle filter by transforming or maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, as recited in claim 14.

To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Since the combination of Araki et al. and Hirota et al. do not disclose, or even suggest, all of the limitations of claims 17, 18 and 21 as more fully set forth above, it is respectfully submitted that the combination of Araki et al. and Hirota et al. do not render obvious claims 17, 18 and 21.

It is respectfully submitted that the cases of In re Fine, supra, and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), make plain that the Office Action's generalized assertions that it would have been obvious to modify or combine the references do not properly support a § 103 rejection. It is respectfully submitted that those cases make plain that the Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that

knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .

Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].

In re Jones, 21 U.S.P.Q.2d at 1943 & 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the present Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Unsupported assertions are not evidence as to why a person having ordinary skill in the art would be motivated to modify or combine references to provide the claimed subject matter of the claims to address the problems met thereby. Accordingly, the Office must provide proper evidence of a motivation for modifying or combining the references to provide the claimed subject matter.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a "technologically simple concept" -- which is not the case here -- there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed," stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Fed. Cir. 2000) (emphasis added). Again, it is believed that there have been no such findings.

In summary, it is respectfully submitted that the combination of Araki et al. and Hirota et al. do not render obvious claims 17, 18 and 21, which depend from claim 14 and therefore include all of the limitations of claim 14. Since claims 17, 18 and 21 depend from independent claim 14, and since Hirota et al. simply do not cure the critical deficiencies of Araki et al., it is respectfully submitted that claims 17, 18 and 21 are allowable for at least the same reasons that claim 14 is allowable. In re Fine, supra (any dependent claim that depends from a non-obvious independent claim is non-obvious).

IV. Conclusion

Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. The attached pages are captioned “**Version with Markings to Show Changes Made.**”

It is therefore respectfully submitted that the presently pending claims are allowable. All issues raised by the Examiner having been addressed, an early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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Version with Markings to Show Changes Made

IN THE CLAIMS:

Claims 14, 22 and 25 have been amended without prejudice as follows:

14. (Amended) An emission control system, comprising:

a particle filter; and

an arrangement disposed upstream from the particle filter and configured to at least reduce clogging of the particle filter by prevention of [prevent] development of ash upstream from the particle filter by one of transformation and maintenance of at least one of the compounds responsible for ash formation in the gaseous state, the arrangement including:

a device configured to collect at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

a device configured to convert the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

22. (Amended) A method for operating an emission control system including a particle filter and an arrangement disposed upstream from the filter and configured to at least reduce clogging of the particle filter by prevention of [prevent] development of ash upstream from the particle filter, comprising the steps of:

maintaining at least a portion of the compounds responsible for the ash formation in a gaseous state;

collecting at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.

25. (Amended) An emission control system, comprising:

a particle filter, and

an arrangement disposed upstream from the particle filter, the arrangement being configured to at least reduce clogging of the particle filter by prevention of [prevent] development of ash upstream from the particle filter by transforming or

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maintaining at least one of the compounds being responsible for the ash formation in the gaseous state, and including:

means for collecting at least a portion of the ash-forming compounds of sulfur contained in the exhaust gas; and

means for converting the collected ash-forming compounds of sulfur into gaseous compounds of sulfur that do not form ash.